Upper Ocean Climatology from Moored Observations

Albert J. Plueddemann
202A Clark Lab, MS-29
Woods Hole Oceanographic Institution
Woods Hole, MA 02543-1541
phone: (508) 289-2789 fax: (508) 457-2181 email: aplueddemann@whoi.edu

Robert A. Weller
204A Clark Lab, MS-29
Woods Hole Oceanographic Institution
Woods Hole, MA 02543-1541
phone: (508) 289-2508 fax: (508) 457-2181 email: rweller@whoi.edu

Award Number: N00014-99-1-0201
Web site: http://uop.whoi.edu

LONG-TERM GOALS

The long term goal is to enable scientific analyses, model development, and engineering design studies which require coincident surface meteorology and upper ocean observations from a variety of environmental regimes. This will be done by the creation of an archive containing data from twenty surface mooring experiments.

OBJECTIVES

There are two specific objectives for the project. First, coincident records of surface forcing and upper ocean variability from twenty surface mooring experiments will be re-processed, archived, and made available to the community on CD-ROM and via web-based data servers. Second, the updated data sets will be used to investigate the climatologies of wind-driven flow and internal waves in the upper ocean.

APPROACH

Surface moorings have been deployed by the Woods Hole Oceanographic Institution (WHOI) to collect meteorological and oceanographic data in a series of experiments starting in the early 1980s (Figure 1). The relative accuracy and completeness of the meteorological data (sufficient to determine the air-sea fluxes of heat and momentum), the high temporal and vertical resolution of the oceanographic data (typically 15 min and 10 m, respectively), and good documentation (in technical reports and journal articles) make these data sets unique. The experimental sites range from open ocean to coastal, span climatic regimes from tropical to subarctic, and include variety of forcing regimes from benign to severe.

We intend to assemble the twenty data sets into an easily accessible archive. Meteorological variables, surface fluxes and upper ocean temperature, salinity (where available) and velocity will be merged, interpolated to a common time base, and stored in a platform-independent, self-documenting format.

Meteorological records will be reprocessed to produce a consistent set of fluxes. A "permanent" archive (on CD-ROM), will be created and an accessible data base (on the web) will be developed.

WORK COMPLETED

We have obtained archived data sets from seventeen of the twenty experiments, translated most of these from their native format and media to netCDF files (Rew, 1993) and collected them on a new workstation which will ultimately be configured as the web server for the database. Routines have been developed to read the netCDF archive files and produce new versions with a consistent format and uniform naming conventions. This will facilitate data access in later stages of the project. A series of html "templates" have been developed. Each template is essentially the outline for a web page which will provide information about and access to a given data set. A basic set of links necessary to navigate these pages has been developed, and more elaborate schemes are being discussed. A prototype web server has been developed using these templates. The database is populated with data from four experiments and is now being tested. Although the server is principally a development tool at present we are receiving and servicing data requests from a variety of interested investigators.

RESULTS

We have developed a multi-faceted approach to data archiving and distribution. The heart of the database will be netCDF data files organized by data type for each experiment. There will be five data types: meteorology, surface fluxes, and subsurface temperature, salinity and currents. The most direct method of data access will be the Upper Ocean Processes Group (UOP) web server, which will be organized by experiment and accessed by selecting the desired data set from a list, a timeline, or a geographic map. We will concentrate on providing complete data files to the user. The UOP workstation will also be configured as a Distributed Oceanographic Data System (DODS; Sgouros, 1999) server, allowing platform- and format- independent access, and more sophisticated access tools (e.g., a direct interface to Matlab and the ability to select data subsets by time and depth). Finally, a series of CD-ROMs will be produced to serve as a more permanent archive and an alternate means of data distribution.

IMPACT/APPLICATIONS

Numerical weather prediction products can be evaluated by comparison with high-quality in-situ fluxes from the buoys, potentially motivating improvements to flux parameterizations and atmospheric physics in the models. The sensitivity of oceanographic models to high-frequency (hours to days) forcing can be determined using the combined air-sea flux and upper ocean data from the moorings. Attempts to use satellite remote sensing to estimate surface fluxes (Curry et al., 1999) can be evaluated by comparison with in-situ data. Design and performance studies of ocean structures can be done using the in-situ data to provide realistic wind and current forcing for different oceanographic regions.

TRANSITIONS

None.

RELATED PROJECTS

We are working with Peter Cornillon's group at the University of Rhode Island to ensure that our moored data archive will be accessible through DODS, as described above. Our use of netCDF data files provides a basic level of compatibility, but some special-purpose tools need to be developed.

We are maintaining a dialogue with the WHOI team developing the Geobrowser, a web-based interface based on the concept of electronic index cards which point to a variety of geophysical time series data organized by geographic location. The Geobrowser may be useful as an alternative means to access the mooring data.

REFERENCES

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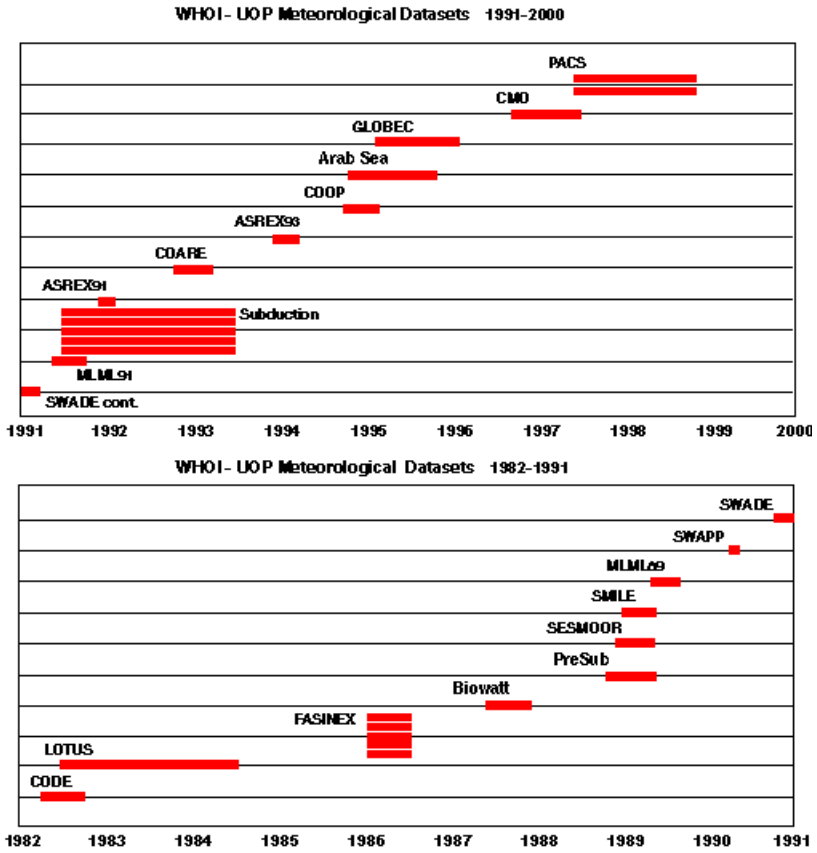

Figure 1. Timeline of data sets from 1982 to the present that will be included in the database. Shaded bars represent the nominal duration of independent meteorological records for each experiment. In most cases coincident meteorological and oceanographic records were obtained from a single mooring or from several moorings in a large array. In other cases multiple oceanographic moorings were associated with the meteorological record obtained at a central site.